AMENDMENTS TO THE CLAIMS

Please amend Claims 35, 42-43, 48-49, and 65 as indicated forth below. Please cancel Claims 2, 6-9, 14-27, 31-32, and 50-64 without prejudice and please add new Claims 66-112 as set forth below.

1.-34. **(Canceled)**

35. **(Currently Amended)** A saturable absorber mirror for passive modelocking of lasers, comprising:

a film of a semiconductor material implanted with high energy ions at a penetration depth which differs from the penetration depth of optical signals reflected from said saturable absorber mirror, said semiconductor material having an ion implantation depth profile selected to provide saturable absorption having a multi-temporal carrier relaxation.

36. **(Original)** A saturable absorber mirror as defined in claim 35, wherein the thickness of said film is selected to be in the range of 50 nm – 2000 nm.

37. **(Original)** A saturable absorber mirror as defined in claim 35, wherein said high energy ions comprise protons, arsenic or beryllium.

38. **(Original)** A saturable absorber mirror as defined in claim 35, wherein the implantation dosage of said high energy ions is in a range $10^{12} - 10^{17}$ ions/cm^2.

39. **(Original)** A saturable absorber mirror as defined in 35, wherein said high energy ions comprise protons and wherein the implantation energy of said high energy ions is in the range of 5 keV – 200 keV.

40. **(Original)** A saturable absorber mirror as defined in claim 35, wherein said high energy ions comprise arsenic, and wherein the implantation energy is in the range of 100 keV – 1000 keV.

41. **(Original)** A saturable absorber mirror as defined in claim 35, where one surface of said mirror is anti-reflection-coated.

42. **(Currently Amended)** ~~A saturable absorber mirror as defined in claim 35,~~ A saturable absorber mirror for passive modelocking of lasers, comprising:

a film of a semiconductor material implanted with high energy ions at a penetration depth which differs from the penetration depth of optical signals reflected from said saturable absorber mirror,

wherein the thickness of said film controls the phase of the reflected light signal within opposite surfaces of said mirror.

43. **(Currently Amended)** ~~A saturable absorber mirror as defined in claim 35,~~ A saturable absorber mirror for passive modelocking of lasers, comprising:

a film of a semiconductor material implanted with high energy ions at a penetration depth which differs from the penetration depth of optical signals reflected from said saturable absorber mirror,

wherein said semiconductor material exhibits multi-temporal relaxation under optical excitation with short optical pulses.

44. **(Original)** A saturable absorber mirror as defined in claim 43, wherein a first relaxation time in said semiconductor film is less than 10 ps and a second relaxation time in said semiconductor film is greater than 100 ps.

45. **(Original)** A saturable absorber mirror as defined in claim 35, wherein said semiconductor film comprises a bulk semiconductor.

46. **(Original)** A saturable absorber mirror as defined in claim 35, wherein said semiconductor film comprises a multiple quantum well structure.

47. **(Original)** A saturable absorber mirror as defined in claim 35, wherein said semiconductor film comprises a combination of a bulk semiconductor and a multiple quantum well structure.

48. **(Currently Amended)** A saturable absorber mirror for passive modelocking of lasers, comprising:

a film of a semiconductor material implanted with high energy ions at a penetration depth which is smaller than the penetration depth of optical signals reflected from said saturable absorber mirror, said high energy ions creating a first trap concentration at a first depth region and a second trap concentration at a second depth region such that said film exhibits saturable absorption governed by a fast time constant and a slow time constant.

49. **(Currently Amended)** A saturable absorber to be operated in transmission for passive modelocking of lasers, comprising:

a film of a semiconductor material implanted with high energy ions at a penetration depth which is smaller than the thickness of said film such that said film exhibits multi-temporal relaxation.

50.-64. **(Canceled)**

65. **(Currently Amended)** A saturable absorber for passive modelocking of lasers operating in the 1.0 – 1.1 um wavelength range~~.~~, comprising~~.~~:

a film of bulk InGaAsP or quantum wells fabricated with a bandgap in the 1.0 – 1.1 um wavelength region, said film implanted with high energy ions at a penetration depth which differs from the penetration depth of optical signals.

66. **(New)** A saturable absorber mirror as defined in claim 35, wherein said ion depth profile is selected to provide saturable absorption having a bi-temporal carrier relaxation.

67. **(New)** A saturable absorber mirror as defined in claim 35, wherein said semiconductor material comprises GaAs related materials or InP related materials.

68. **(New)** A saturable absorber mirror as defined in claim 35, wherein said saturable absorber mirror is electrodeless.

69. **(New)** A saturable absorber mirror as defined in claim 35, wherein said film exhibits a depth-dependent ion concentration profile having a peak value and a minimal value.

70. **(New)** A saturable absorber mirror as defined in claim 69, wherein the depth corresponding to said minimal value is at said penetration depth of optical signals.

71. **(New)** A saturable absorber mirror as defined in claim 35, further comprising a heat sink disposed with respect to said film to sink heat therefrom.

72. **(New)** A saturable absorber mirror as defined in claim 42, wherein said semiconductor material comprises GaAs related materials or InP related materials.

73. **(New)** A saturable absorber mirror as defined in claim 43, wherein said semiconductor material comprises GaAs related materials or InP related materials.

74. **(New)** A saturable absorber mirror as defined in claim 48, wherein said semiconductor material comprises GaAs related materials or InP related materials.

75. **(New)** A saturable absorber mirror as defined in claim 48, wherein said film exhibits bi-temporal carrier relaxation.

76. **(New)** A saturable absorber mirror as defined in claim 48, wherein said saturable absorber mirror is electrodeless.

77. **(New)** A saturable absorber mirror as defined in claim 48, wherein said film is anti-reflection-coated.

78. **(New)** A saturable absorber mirror as defined in claim 48, wherein said fast time constant is less than 20 ps and said slow time constant is greater than 100 ps.

79. **(New)** A saturable absorber mirror as defined in claim 48, wherein said fast time constant is less than 10 ps and said slow time constant is greater than 100 ps.

80. **(New)** A saturable absorber mirror as defined in claim 48, wherein said fast time constant is less than 1 ps and said slow time constant is greater than 100 ps.

81. **(New)** A saturable absorber mirror as defined in claim 48, wherein said first trap concentration at said first depth region is a peak value and said second trap concentration at said second depth region is a minimal value.

82. **(New)** A saturable absorber mirror as defined in claim 81, wherein said peak value controls said fast time constant.

83. **(New)** A saturable absorber mirror as defined in claim 81, wherein said minimal value controls said slow time constant.

84. **(New)** A saturable absorber mirror as defined in claim 48, wherein said film is attached to a heat sink.

85. **(New)** A saturable absorber mirror as defined in claim 84, wherein said heat sink comprises metal, diamond or sapphire.

86. **(New)** A saturable absorber mirror as defined in claim 84, wherein said heat sink comprises a metallic mirror.

87. **(New)** A saturable absorber as defined in claim 49, wherein said film exhibits bi-temporal relaxation.

88. **(New)** A saturable absorber as defined in claim 49, wherein said semiconductor material comprises GaAs related materials or InP related materials.

89. **(New)** A saturable absorber as defined in claim 49, wherein said material is aluminum-free.

90. **(New)** A saturable absorber as defined in claim 89, wherein said aluminum-free material comprises InGaAsP material.

91. **(New)** A saturable absorber as defined in claim 49, wherein said material has a wavelength bandedge of approximately 1 micrometer.

92. **(New)** A saturable absorber as defined in claim 49, wherein said material has a wavelength bandedge between 1.0 and 1.6 micrometers.

93. **(New)** A saturable absorber as defined in claim 49, where one surface of said film is anti-reflection-coated.

94. **(New)** A saturable absorber as defined in claim 49, wherein said saturable absorber is electrodeless.

95. **(New)** A saturable absorber as defined in claim 65, wherein said film exhibits multi-temporal relaxation.

96. **(New)** A saturable absorber as defined in claim 65, wherein said film exhibits bi-temporal relaxation.

97. **(New)** A saturable absorber as defined in claim 95, wherein a first relaxation time in said film is less than 10 ps and a second relaxation time in said film is greater than 100 ps.

98. **(New)** A saturable absorber as defined in claim 65, wherein said film is anti-reflection-coated.

99. **(New)** A saturable absorber as defined in claim 65, wherein said saturable absorber is electrodeless.

100. **(New)** A saturable absorber as defined in claim 65, further comprising a heat sink.

101. **(New)** A saturable absorber as defined in claim 65, further comprising a dielectric mirror.

102. **(New)** A saturable absorber as defined in claim 65, further comprising a reflector comprising gold or silver.

103. **(New)** A method of producing optical pulses, said method comprising directing light into a saturable absorber comprising a semiconductor material implanted with high energy

ions at a penetration depth which is smaller than the penetration depth of said light directed into said saturable absorber, said high energy ions having a depth profile such said saturable absorber exhibits multi-temporal carrier relaxation.

104. **(New)** A method of producing optical pulses as defined in claim 103, wherein said ion depth profile is such that said saturable absorber exhibits bi-temporal carrier relaxation.

105. **(New)** A method of producing optical pulses as defined in claim 103, wherein said ion depth profile is such that said saturable absorber exhibits a first relaxation time less than 10 ps and a second relaxation time greater than 100 ps.

106. **(New)** A method of producing optical pulses as defined in claim 103, wherein said saturable absorber is electrodeless.

107. **(New)** A method of producing optical pulses as defined in claim 103, wherein said semiconductor material comprises GaAs related materials or InP related materials.

108. **(New)** A method of manufacturing a saturable absorber, said method comprising implanting a semiconductor material with high energy ions at a penetration depth which is smaller than the thickness of said semiconductor material thereby creating a first trap concentration at a first depth region and a second trap concentration at a second depth region such that said semiconductor material exhibits saturable absorption governed by a first predetermined fast time constant and a second predetermined slow time constant.

109. **(New)** A method of manufacturing a saturable absorber as in claim 108, said method further comprising implanting the semiconductor material such that said first predetermined fast time constant is less than 10 ps and said second predetermined slow time constant is greater than 100 ps.

110. **(New)** A method of manufacturing a saturable absorber as in claim 108, wherein said step of implanting a semiconductor material with high energy ions further comprises providing an ion implantation depth profile selected to provide saturable absorption having a bi-temporal carrier relaxation.

111. **(New)** A method of manufacturing a saturable absorber as in claim 108, said method further comprising providing a saturable absorber that is electrodeless.

112. **(New)** A method of manufacturing a saturable absorber as in claim 108, said method further comprising providing said semiconductor material that comprises GaAs related materials or InP related materials.